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PSYCHOLOGY AND SCIENTIFIC METHODS

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THE JOURNAL OF PHILOSOPHY
PSYCHOLOGY AND SCIENTIFIC METHODS

BEHAVIOR AND THE CONCEPT OF MENTAL DISEASE

FOR some years I have been attempting to understand the physician's concept of mental diseases. Not long ago I had the pleasure of attending a medical meeting and of listening to a physician who has been very successful in his treatment of neurasthenia. Several cases of neurasthenia were described. Since none of the patients showed general organic disturbances of a serious kind and since all of the neurological tests showed normal functioning of the reflexes of the central nervous system, the physician concluded that the disease was "purely mental." He then began to describe the condition of such a patient's ego—the general content of consciousness, the inward reference of attention, and the peculiarities of the field of attention. At the end of his discourse two or three eminent physicians stated their satisfaction that the speaker had been willing to come out clearly and say that the disease was *"mental."* In other words, they expressed their approval of the fact that the speaker did not, in functional nervous cases, deem it necessary to find lesions in the central nervous system or even a toxic condition of the nervous system before admitting that the patient had a disease.

Being the only psychologist present, I did not like to admit that I did not understand the physician's use of the term "mental." (I do not wish by this assertion to stir up strife or bitter argument, but rather to confess ignorance on my own part and to seek for some common ground of discussion.) As a sequel to this meeting I began to attempt to formulate my own ideas as to the terminology I should use in describing a mental disease. I think that at the outset I should admit that I know a good deal more about terminology than I know about diseases of any kind. I am strengthened in this attempt to give my concept of mental diseases by the difficulty I have had in understanding the terminology (involving throughout and often transcending the current concept of consciousness) of the psychoanalytic movement.

I have been for some years an earnest student of Freud (and other psychoanalysts), but the further I go into their terminology

the more sure I am that there is a simpler and more common-sense way (and at the same time a more scientific way) of describing the essential factors in their theory. I am convinced of the truth of Freud's work, but as I teach the Freudian movement to my classes I drop out the crude vitalistic and psychological terminology, and stick to what I believe to be the biological factors involved in his theories (Freud himself admits the possibility of this). The central truth that I think Freud has given us is that *youthful, outgrown, and partially discarded habit and instinctive systems of reaction can and possibly always do influence the functioning of our adult systems of reactions, and influence to a certain extent even the possibility of our forming the new habit systems which we must reasonably be expected to form.*

To my students in psychology I usually introduce the habit terminology somewhat as follows:

Long before Freud's doctrine saw the light of day William James gave the key to what I believe to be the true explanation of the wish. Thirty years ago he wrote: "... I am often confronted by the necessity of standing by one of my selves and relinquishing the rest. Not that I would not, if I could, be both handsome and fat and well dressed, and a great athlete, and make a million a year, be a wit, a *bon-vivant*, and a lady-killer, as well as a philosopher, a philanthropist, a statesman, a warrior, and African explorer, as well as a 'tone-poet,' and a saint. But the thing is simply impossible. The millionaire's work would run counter to the saint's; the *bon-vivant* and the philanthropist would trip each other up; the philosopher and the lady-killer could not well keep house in the same tenement of clay. Such different characteristics may conceivably at the outset of life be alike *possible* to a man. But to make any one of them actual, the rest must more or less be suppressed."

What James is particularly emphasizing here is that the human organism is instinctively capable of developing along many different lines, but that due to the stress of civilization some of these instinctive capabilities must be thwarted. In addition to these impulses which are instinctive and therefore hereditary, there are many habit impulses which are equally strong and which for similar reasons must be given up. The systems of habits we form, *i. e.*, the acts we *learn* to perform, at four years of age will not serve us when we are twelve, and those formed at the age of twelve will not serve us when we become adults. As we pass from childhood to man's estate we are constantly giving up thousands of activities which our nervous and muscular systems have learned to perform and which they still have a tendency to perform. Some of the instinctive tendencies born with us are poor heritages; some of the habits we early develop

are equally poor possessions. But whether they are "good" or "bad" they must give way as we put on the habits required of adults. Some of them yield with difficulty and we often get badly twisted in attempting to put them away, as every psychiatric clinic can testify.[1]

I then try to show that such habit systems need never have been "conscious" (and here all I mean by being "conscious"—and all I believe the psychopathologists mean by it—is that *the patient can not phrase in terms of words the habit twists which have become a part of his biological equipment*). The implication is clear that in the psychoneuroses I should look for *habit disturbances*—maladjustments—and should attempt to describe my findings in terms of the inadequacy of responses, of wrong responses, and of the complete lack of responses to the objects and situations in the daily life of the patient. I should likewise attempt to trace out the original conditions leading to maladjustment and the causes leading to its continuation. To these statements most psychopathologists will subscribe, but most of them will insist that maladjustments can not be stated wholly in behavior terms. It is just here that I think my difficulty in understanding the psychiatrist's position begins. I believe that the description of "mental" cases can be completed as well as begun in behavior terms.

I think the chief difficulty in completing the description in terms of the every-day languauge of habit formation lies in our failure to look upon *language* (the patient's here) as being only a system of motor habits. As a short cut—a system of economy—the human animal has formed a system of language habits (spoken words, inner speech, etc.). These language habits are built up from and always correspond more or less closely to the general system of bodily habits (I contrast here for convenience of expression *language habits* and *bodily habits*) such as the eye-hand, ear-hand, etc., systems of coordination and their complex integrations. This general correspondence between language and bodily habits is shown clearly in the football field, where we see the player making a complex series of movements and later hear him stating in words what systems of plays he employed; and in the case where we hear a man tell us what acts he is going to perform on a horizontal bar and later see him executing these acts. Words have grown up around motor acts and have no functional significance apart from their connection with motor acts. I have come recently to the view that speech should be looked upon as a vast system of *conditioned reflexes*. In a previous paper[2] I sketched the method of establishing motor and secretory conditioned reflexes. As Pawlow and Bechterew have shown,

[1] From a written but unpublished lecture.

[2] "The Place of the Conditioned Reflex in Psychology," *Psychological Review*, March, 1916.

the central feature of the method consists in the fact that almost any stimulus can, under suitable conditions, *be substituted for another stimulus* which has a very definite act of its own as a consequence. An electric contact applied to the sole of the foot will produce a defensive reflex—a jerking up of the foot. A monochromatic light produces no such effect. If, however, the light is allowed to fall upon the retina of the eye at the moment the foot is stimulated electrically, we will (after repetition) bring about a condition such that the light alone will produce the defensive reaction of the foot. Words as words are learned largely by imitation, but words receive their standing as functional units in integrated habit systems by virtue of the fact that they become *substitutable for the stimulus which originally initiated an act.* A simple illustration will possibly serve to make clear my point. The cold air from an open window leads a child who has gone to bed to draw up the covers. The words of the nurse "cover up, dear" will lead to the same act. Of course in habit systems as complex as those in speech, words get further and further divorced from the original stimuli for which they were substituted (*i. e.,* from the original integrations in which they first played a part). The final test of all words, however, is the question whether they can stand adequately (be substituted) for acts. We often see an instructor despair of telling a student in words how to conduct an experiment. He then resorts to acts and goes through the experiment for the student. Our words thus stand as a kind of shorthand sketch of our repertoire of acts and motor attitudes.

I have developed these points at length because a great many of the symptoms of so-called mental cases consist in disturbances of speech functions—in maladjustments of that nice balance which should exist between speech acts and bodily acts (and, perhaps even more, disturbances among the "speech functions" themselves). For fear that I may be misunderstood in my use of the term "disturbance" of speech I wish to say that I have no reference here to aphasia. I mean, among other things, by speech disturbance what the Freudian means: For example, in the manifest content of dreams one finds new words, misplacement of words, condensation of words, etc.; and in the association test the failure of words and an increased reaction time between stimulus word and response. These are speech disturbances and hence *habit disturbances,* exactly on a par with the paralysis of arm or leg in hysteria, defensive reactions, compensatory reactions, and the like. All such disturbances of habit—superfluous and useless conditioned reflexes—may be found to date back to some primary stimulus (possibly to sex trauma, exposure,[3] masturbation,

[3] I believe it takes more than a single shock or disturbance to bring such conditional reflexes in its train. Usually I believe it is a long-continued struggle with environment which brings them.

etc., in childhood) which is the conditioning cause operating just as the electric shock given jointly with a visual stimulus operates in forcing the visual stimulus finally to release a group of responses which, until the current was applied, brought none of them.

Motor tics, the seeming paralysis in hysteria, etc., are to be envisaged in the same way; as types of conditioned reflexes, which are no more wonderful and no less wonderful than the cases in the laboratory where the sound of a bell does not at first cause a subject to jerk back his arm, but which later comes to do it after we have jointly stimulated the hand with an electric current and the ear with the bell. Nor will the objection hold that conditioned reflexes arise only in the laboratory. Dr. Lashley has shown that numerous such conditioned reflexes exist in the functioning of the parotid gland in man, and that these reflexes arise in the regular course of daily activity. So pronounced are they that a subject can not very well experiment upon himself. If he reaches forward to get a pipette full of acid to test its effect in increasing the activity of the gland, the gland begins to function as he reaches for the acid. Now if conditioned reflexes can arise in the salivary gland, they can and possibly do arise in all glandular and muscular portions of the body. The possibility that ties and hysterical manifestations generally arise in this way is very great. It seems to me to be the only biological formulation possible in the present state of our knowledge.

Is it not simpler, then, to look upon all such manifestations as special forms of conditioned reflexes? As long as they do not disturb the subject's ordinary reactions to the objects around him, we do not class the patient as being "mentally" disturbed (as in the psychopathological disturbances we see in daily life); the moment, however, that an arm is incapacitated or the glandular and muscular elements of the sex organs become involved we must take notice of such grave disturbances and try to see what can be done. If now we can take what appears to me to be a sensible point of view about language habits ("thought") and come to look upon them as obeying the laws of all other habits, and describe our patient's symptoms wholly in terms of habit disturbance, and trace the conditions which have led to the disturbance, we shall have come a long way. We could throw over bodily the enormous and burdensome terminology of a description in terms of consciousness—disturbances of the affections, misplacement or withdrawal of the libido (a concept which, in Jung's latest book on the "Subconscious," has become the equivalent of Driesch's entelechy), repressions into the subconscious, and the like.

I think I can illustrate what I mean by describing a hypothetical "neurasthenic dog." Suppose I take a dog to a canine psychiatric

clinic and tell the physician nothing about the dog's previous history. The physician puts the dog through a searching neurological examination, makes a thorough test of heart action, examines the urine, etc. Absolutely no pathological disturbances are found. He finds, however, on testing the dog's reactions to his normal canine environment that there are serious functional disturbances. When the normal dog sees a piece of red meat, he snaps at it. The "neurasthenic" dog, however, lies down and becomes absolutely motionless. When brought near a female of his own kind, far from exhibiting the usual reactions, he begins to shed tears. When spoken to in gentle tones, he hangs his head, puts his tail between his legs, but when spoken to gruffly he brightens up and lifts his head and licks the speaker's hand. When preparing to sleep, instead of turning round and round and lying down with anterior and posterior ends in close relations, the dog jumps up and down and finally lies down on his back with his paws pointing to the stars. The physician surely finds here serious conflict with reality and a woeful lack of normal compensations. But since there are no organic pathological disturbances, the physician diagnoses the case as neurasthenia with compulsion neurosis—the disease is mental.

When I come to the clinic and see the physician and talk with him I explain that there is no need to introduce any concept of the "mental," I tell him that I have *trained the dog* during the past five years to do just these things. The trouble with the dog is that his habits are twisted. Now if I had started with a dog whose instinctive reaction systems were (possibly) perverted in the beginning (heredity) and I had superposed in addition the above bizarre group of habit reactions, he would seem a pitiful object indeed when trying to cope with his environment.

Now as to the cure of the dog. I should begin step by step to *retrain* the dog along lines which would make him better fitted to cope with his environment. If there were sufficient plasticity left I should undertake it with a good deal of hope. The length of time required for the cure and the rapidity of the cure would depend upon several factors—such as my luck in fixing upon just the right method for breaking up the old non-serviceable habits, the length of time the old habits had been in force, upon the tractability of the dog, etc.

If I understand their teachings, this cure which I suggest is the keynote of the work of the psychopathologists. It is certainly that of Adolf Meyer. I doubt if Dr. Meyer will go as far as I do in holding that the time has already come for describing "mental diseases" wholly in terms of twisted habits, and yet it was a conversation which I had with him three or four years ago that first led me to think

over functional nervous cases in this way. Nor can I see where the straight Freudian adherents can have any cause for complaint. Every psychopathologist begins with a conversation with his patient. In the conversation certain words begin to give indications of the "complex" (maladjustment). The habit twist is made still clearer by the results of tests with the word-association method, by the analysis of the patient's dreams, by inference, and by common-sense observations. In course of time the maladjustment is completely located, and its origin, development, and consequences are fully traced. Now during the process of study, the patient's reeducation (usually, but not necessarily, along sex lines) has already begun. In fact it began the moment the physician secured sufficient acquaintance with the patient to begin analysis. (Brill states that he will not attempt analysis until he has known the patient for at least a week.)

Several psychopathologists have thought that the objective methods and terminology which we have sought to introduce would necessarily do away with conversation with the patient. This is not true. Speech is just as objective as tennis-playing or any other muscular act and should be looked upon in just as objective a way. The difficulty has been that instead of looking at speech as at other muscular acts, we have looked upon it as a revealer of "thought" —the sacred inner secret of the "mind." Now in testing out a neurasthenic patient one of the first things we do is to find out what disturbances there are in the movements of hands, arms, and body as a whole. We watch and describe them in wholly objective ways. Is it not possible to look upon speech disturbances in just such an objective way and see in them merely signals which will lead us to the disturbed systems of bodily integrations? In a particular case we may find (without admitting that we must find it so) that the speech defects point to the "incest complex" in one form or another. The faulty and unwise behavior of a mother has led the boy to react to her in many particulars as does her husband. Such a group of integrations on the boy's part seriously disturbs the forming of suitable boyish habits and may bring in its train a vast series of conditioned reflexes which may show themselves in general bodily disturbances, such as tics, paralysis, etc., or in speech defects, such as failures in word responses, lengthened reaction time, etc.

My thesis so far has concerned itself with *motor habits.* The muscles form only a part of the total reaction system. Every motor reaction calls for a simultaneous response in the glandular system (corresponding in part at least to the *affective values* of the psychologists and psychopathologists). Now the chief symptom in many cases of mental disease is the disturbance of "affective values" (withdrawal of the libido, etc.). It is to take account of this puzzling

transfer that has led the Freudian school to speak as though the "affective process" could be disembodied from any particular response and hang suspended as it were in mid-air[4] (the "subconscious" is introduced here by Freud). From time to time, to be sure, it attaches itself to certain responses, but these responses may bear no relation to the original stimulus which called it forth.

The modern notion of emotional[5] reactions calls first for the presence of an emotionally exciting stimulus, which will, through hereditary mechanisms, excite neural arcs leading through the central and the autonomic systems, finally arousing activity in the glands—especially in the ductless glands. The latter then set free certain substances, *e. g.*, adrenin, among other things, which, on getting into the blood, continue the emotional activity just as though the original stimulus were present. As I view the matter we have here just the situation for arousing *conditioned emotional reflexes.* Any stimulus (non-emotional) which immediately (or shortly) follows an emotionally exciting stimulus produces its motor reaction before the emotional effects of the original stimulus have died down. A transfer (conditioned reflex) takes place (after many such occurrences) so that in the end the second stimulus produces in its train now not only its proper group of motor integrations, but an emotional set which *belonged originally to another stimulus.* To apply this in detail in functional cases oversteps my ability as well as my present interests. At any rate the suggestion seems to me to give a reasonable clue as to the way in which such shifts in the emotional constituents of a total integration can occur. Surely it is better to use even this crude formulation than to describe the phenomenon as is done in the current psychoanalytic treatises. What is simpler than to speak of a transferred or conditioned emotional response, giving both the

[4] I quote from Ernest Jones who is interpreting Freud's theory of affective processes: "Most significant, however, is the assumption that it has a certain autonomy, so that it can become released from the idea to which it was primarily attached, thus entering into new psychical systems and producing widespread effects. This displacement of affect from one idea to another Freud denotes as transference (*Uebertragung*), and says that the second idea may in a sense be termed a representative of the first. A simple illustration of the process is when a girl transfers the affective process properly belonging to a baby to that of a doll, and even takes it to bed with her and makes attempts to feed it, thus treating it in all possible respects as she would a baby." Papers on Psycho-Analysis.

[5] I prefer to keep the term "emotion" in objective psychology. I, however, throw away all of the conscious implications. To me an emotion is a bodily state which can be observed in man and animal equally well, such as the bristling of hair, shedding of tears, increase or decrease in respiration, sighing, heightened muscular activity, and the like. Some day we shall be able to mark off these objective states and classify them with respect to the types of stimuli which call them out (sex, food, shelter, noxious odors, etc.).

object (or situation) which originally called out the emotional response and the object (or situation) to which it was transferred?

In conclusion I wish to say that I am not attempting to launch criticisms at the head of the psychopathologist. If his terminology is involved it is the fault really of psychology, since he perforce had to use the concepts which psychology had developed. I have tried in this paper merely to raise the question whether the psychopathologist can not reshape to some extent his formulation of problems (without doing injustice to the patient) so as to avail himself of biological and behavioristic concepts.

Psychological terminology is, I believe, being fast outgrown. Dunlap's recent inquiry[6] into the definitions of psychological terms shows, I believe, more clearly than I can state, just how little agreement there is among psychologists in the use of common psychological terms. It seems to me to be a mistake for as useful and fascinating a growth as psychopathology to allow itself to become encrusted with the barnacles of an outgrown terminology.

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PHILOSOPHIC FORMALISM AND SCIENTIFIC IMAGINATION[1]

I

THE art of mathematics possesses so compact a neatness, is so harmonious a union of fluidity and rigidity, that it exercises a hypnotic fascination over all types of mind. The philosopher's preoccupation with it, since Pythagoras, his abortive attempts to impart its form to his themes, are notorious. It manifests such a magic precision, such an ineluctable definiteness, such a so-ness, that the uninitiate stand in awe, and the initiate find it the quintessence of those conditions which satisfy our sentiment of rationality: it supplies activity without frustration, plurality without confusion, unity without monotony. As Mr. Bertrand Russell says, "Mathematics take us still further from what is human, into the region of absolute necessity, to which not only the actual world, but every possible world, must conform; and even here it builds a habitation, or rather finds a habitation eternally standing where our ideals are fully satisfied and our best hopes are not thwarted." Again: "the world of pure reason

[6] Knight Dunlap, "The Results of a Questionary on Psychological Terminology," *Johns Hopkins Circular*, 1916, No. 5.

[1] A review of "The Concept of Consciousness." Edwin B. Holt. London: George Allen and Company, Ltd. 1914. Pp. xix + 343.

[*i. e.*, of mathematics] knows no compromise, no practical limitations, no barrier to the creative activity embodying in splendid edifices the passionate aspirations after the perfect from which all great work springs. Remote from human passions, remote even from the pitiful laws of nature, the generations have gradually created an ordered cosmos where pure thought can dwell as in its natural home, and where one, at least, of our nobler impulses can escape from the dreary exile of the actual world."

Mr. Russell, it happens, is not merely a philosopher writing about mathematics. He is also a mathematician writing philosophy. It is to his labors that neo-realism is indebted for its precisian formalism and its dogmatic bias. His passionate utterance, therefore, is something, willy-nilly cathedral for a school become fanatic about "absolute necessity, to which not only the actual world, but every possible world must conform." The mood is not limited to the school, however. It is the mood of all metaphysical sects as well, being but the exteriorization of that inward passion for unity or consistency, of the "logical motive" in human nature, of whose self-defeating explication the systems of tradition are the striking outcome. A mere pragmatist like myself might point out that there was nothing sacrosanct about this motive and its satisfactions, that it might be accounted for in terms of definite vital needs and operations, that it is pervasive, that mathematics and philosophy are merely aristocratic arts using highly specialized media, but otherwise typical enough of the common appetites of our common nature. But then I should be told that I exhibit very little understanding of the "logical motive," so I am tempted to desist. I note curiously, however, that Mr. Russell's sense of form and of absolute necessity does not seem to operate when he is honestly facing data and seeking to account for existence, that the gospel of the logic of mathematics is preached in other fields than mathematics by quite other men, and that neo-realism, in so far as it is really a systematic metaphysic, has its St. Paul as well as its Jesus. Thus the organizer of neo-realistic salvation seems to be Mr. Holt.

Mr. Holt appears to possess what Mr. Russell has so far not manifested, a scientific and romantic, as against a formal, imagination, an imagination alive to the experiences of the laboratory and the motives of men. The combination of this imagination with the logical passion and the slang of philosophical mathematics has resulted, at his hands, in a genuine system which throws the living world into a fresh perspective and enriches the tradition with a new world-picture. The manner of it, if one bear in mind the futurism of Bergson, is distinctly cubistic, and "the neutral mosaic" which is the total of Being in Mr. Holt's thought is a conception that leads the mind perforce to "the nude walking down the staircase." For in

that picture, you see, there really isn't any nude and there really isn't any staircase: there are only angles of illumination meeting other angles of illumination in specific ways; and if you observe the meeting in one of those specific ways, you have a nude walking down a staircase, but if you observe it in another of the specific ways, you have a staircase walking up a nude. The difference derives from the relations, not the terms: the terms are neither nude, nor staircase; they are purely neutral angles of light.

I do not wish to appear to put the position with undue levity. The analogy seems to me to express adequately the problem which Mr. Holt's intention and procedure raise. His intention is to deduce consciousness from a few elemental somethings that are not consciousness. His procedure is to develop it from a few primitive logico-mathematical postulates that "imply it," just as the triangularity of a triangle implies that the sum of its angles is equal to two right angles. In doing so he borrows his units from logic; whatever is, must be a term, or a relation, or a proposition: he traverses the whole expanse of existence, in its depth and in its breadth: he reviews and summarily dismisses most of the historic portraits of the universe he does not like: he reinterprets and makes use of a number of postulated conceptions, such as "logical change," "specific response," and "universal," in a fresh and exciting way. Withal, he manages to keep close enough to the data of the laboratory to give his speculations the air of factual plausibility as well as consistency, and he does it in a manner somewhat staccato and shrill, but lively and colorful enough to make it a style. When you have mastered his rather perverse vocabulary and have learned to know the usual things by their new unusual names, you find a really intelligible vision which adds a new dimension and a liberating perspective to the actualities of the daily life, like a landscape in a dining-room.

Nature appears in this perspective as a self-generating hierarchy, moving from the simple to the complex; from the one or the few, to the many; from the "neutral" to the psychical and material; from the indifferent to the valuable. It has a structure which the order of the sciences echoes. For they also move from simple to complex and constitute a deductive hierarchy, wherein the series from colors, sounds, and the other secondary qualities, through geometry, mathematics, physics, chemistry, geography, astronomy, biology, psychology, sociology, economics, the theory of values, all derive from the simple entities of logic, which are the walls of the world and the foundations of reality. They constitute an asymmetrical deductive series, of which the more complex presupposes the less complex, equivalent to it in being and dependent upon it for its distinguishing traits. Consciousness, the domain of psychology, belongs to the most

complex and superficial of the syntheses of neutrals, so that the definition of the "concept of consciousness" is impossible in terms less than the whole metaphysical system from which it is to be "deduced." That system is implied, but not achieved. Mr. Holt is perforce compelled to content himself with deducing consciousness from those "entities in the neutral series that are simpler and more fundamental than minds," that "immediately precede in point of simplicity." Now there exist "physical objects—organic and inorganic entities, both living and dead." These are composed of simpler, neutral entities. They environ the living organisms which respond specifically to some of their neutral constituents and not to others. Such response delimits a field of neutral beings which compose a definite and particular "cross-section" of that being. The field so delimited is consciousness. "In fine the consciousness that depends on any given living organism is the sum-total of all neutral entities to which that living organism responds, and it is the system of these entities in just such and such quantity and just such and such spatial and temporal arrangement of the environment as the responses themselves define."

II

The character of Mr. Holt's method and the significance of his deductions cause the validity of this definition to depend inevitably upon the validity of the concepts from which it is generated. His dialectic seems to me to support its whole movement upon the three notions: (1) "logical activity," (2) "universal," (3) "specific response." These are his fundamental postulates. Without them the differentiating dogmas of neo-realism, declaring consciousness to be an external relation and thought and thing numerically identical, could not emerge. They are the "indefinables" of the system, and their compatibility and validity determine that of the system. For this reason I shall consider them alone, and in the order named, rather than the system as a whole.

1. "Logical activity," Mr. Holt writes, "does not of course involve time; but time involves it, being a special case thereof." What is called "logical necessity" is similarly derivative and secondary, designating merely the correspondence between the thinker and that which is and always was. "Given a surface and the formula of any curve, however complicated, and the entire curve forthwith *is*: and the geometer follows after with his deductive thought to learn what this is." But what is an activity such that antecedent and consequent are simultaneous? Not, obviously, one involving what is usually meant by activity—duration and change, a strain of succession between the prior and the subsequent. It is identical with what is ordinarily meant by "implication." A proposition and its implicates are simul-

taneous and instantaneous. One implies and posits all; all imply and posit one. The mere being of "simples" is thus necessarily coincident with their combination into all sorts of complexes. There can be no possibilities, no potentialities in Mr. Holt's world. All is actual, the water which may result from the still uncombined hydrogen and oxygen, the chicken from the still unhatched and perhaps never to be hatched egg. Activity, change, time, in the usual signification of these terms are purely illusions, being definable by means of instantaneous and simultaneous relations of *before* and *after* (Royce, *idem*) merely, in which things past and things to come stand to each other from all eternity. The geometer *following* "with his deductive thought" is unthinkable in a world that merely *is*. Contradiction, in the discussion of which Mr. Holt has shown much acumen and originality as well as perversity, is no less impossible, and with it error of the Holtian kind, and other things dear to the neo-realists. For Holt insists that contradictions *emerge*, that they are not instantaneous, but eventual: "a set of contradictory propositions need not be utterly contradictory; it may generate a considerable system of terms in relation before the contradiction is at all manifest, as is shown by the fact that the logician often proceeds for some time in the deduction of a system of terms in relation from a set of postulates, until at some point the propositions *meet* in contradiction. Nor is it through any error of deduction that the contradiction was not earlier." Earlier! Logically or temporally earlier? Surely "logical priority" is temporal instantaneity, yet if the phrases quoted mean anything, they mean that there has been a lapse, a stretch, and that something which was not, has become. Holt's notion of activity, in a word, shifts from the meaning he assigns it to the meaning it ordinarily has, and its use to designate real processes, such as the emergence of contradictions does greater credit to his common-sense than his consistency. Observation of analogous data led Russell to distinguish between relations as terms, and relations as "relating"—*relations inert*, in a word, and relations in action, a distinction ultimately, and ultimate, between *being*, and *doing*. Formally, Holt's procedure not only uses, it requires, this distinction. His assumption is, however, that propositions or relations (he identified the two) are inseparable from their activity. If, on the other hand, he concedes them to be separable, then activity becomes a quality which accrues to propositions independently, a quality entirely detachable from them, contingent and non-implicative: Being, being inert, is self-consistent. The result is a dilemma: either activity can not be the ground of deductive necessity or contradictions are subjective illusions.

The ambiguity of meaning in Holt's use of the term activity is

still clearer in his discussion of the knowledge of past time, that is, of memory; and of future time. Since, in his system, the idea and object are identical, present knowledge of a past event can not be anything less than knowledge of an event *going on now.* Similarly, knowledge of the future is the being *now,* of *something which is not yet.* Consequently, past and future either both are and are not, are experienced as "B-not-B," which "no one ever experienced," or there is a genuine difference between knowledge and its object, and *meaning* is an activity other than merely logical implication. Underlying the ambiguity is, of course, a formal staticism, which has denatured activity, and has ignored the genuine character of temporality and substituted for it the spatial relationships of *before* and *after.* Since you can distinguish a row of simultaneous objects as before and after each other, and since this seems all that remains when the *generative process* which so posited the objects is ignored, time gets identified with *nothing but* this spatial series and the epistemological trick is turned. So Noah building his ark has a position "in" time "before" Caesar building his bridge identically as 2 has a position in the number system before 3 and after 1. *Before* and *after* have thus no other designable content than *in front* and *behind:* "the relation of the knowledge system to time is precisely what it is to space." Proof: you can ignore the temporality of an event and deal with its spatiality. Then you can attribute, without further examination, the discoveries in the one field as traits to the other. Thus, you declare that response to the past is the same as response to distance. You demonstrate the identity by example, so: "if the auditory stimulus of the name of a person who is dead causes a nervous system . . . to produce tears, it is by no means the mere acoustical energy transmitted to the ear that has done this; but a highly peculiar arrangement of nervous arcs that were so organized by past events, it is so-to-say 'stored stimuli,' which only this peculiar configuration of acoustic energies could now set in action. . . . The present response is then not solely a function of the present stimulus, but of past stimuli as well; it is, and will ever continue to be, a revived response to past stimuli." A past stimulus, please note, is one which no longer stimulates. Either, therefore, the past stimuli are identical with and present as "stored stimuli," hence not past at all, or the "stored stimuli" are different from the stimuli that *caused* the storing. Whichever be the case, the response is immediate and present to immediate and present stimuli. Otherwise, logic requires us to be responding to the identical stimuli, once directly present, now long past, which moved our quadrumanous ancestors. If this be so, why do we not know those entities as such, and know them, moreover, as *past?*

All in all, the notion of "logical activity" can not be said to yield the neo-realist any advantage. Strict adherence to it does not abolish the traditional distinctions between appearance and reality, thoughts and things; it only stretches the gulf between them wider, redoubling the force of the traditional problems of philosophy. This, however, is the precise eventuality neo-realism seeks to prevent. The difference between appearance and reality, it holds, is *nil;* the difference between thoughts and things is *nil;* the genuine efficacy of causes is *nil.* All being reduces to coordinations of immutable, self-repeated simples; all action to instantaneity of concomitant invariant variations. The world is petrified, and plurality, motion, change, and life have still to be accounted for.

2. What is invoked to account for them, in addition to "logical activity," is the universal. This, with its peculiar relation to the particular, is the second of Mr. Holt's necessary indefinables. The upshot of his exposition may be summarized as follows. What distinguishes a universal from a particular or individual is its constant duplicability, or rather, self-duplication. An individual is a "this and no other," so defined by its position in a system. A universal is not. A universal is, in Royce's phrase, "self-representative, and in such a way that the relations between itself and its otherselves are internal to their terms." This internality is implied in the very law of identity, "A is A" so that the factual character of the universal is the "repetition of identicals." It possesses a "deductive fecundity" and constitutes thereby "the sole *connected meaning* of the 'living' whole." It is a genetic formula which generates the many from itself by repeating itself. Every "proposition" or relation is a universal, the terms it posits being dependent upon it for their being. It is their essence, their "connected meaning," internal to them and constituting them. "And so far as any of the terms are related to one another, it is because their being is not independent, although the terms are distinct, but is *generated* by the logical activity of a proposition." "Universal" and "logical activity" are, it will be seen, coimplicative. I am not sure that Holt's exposition permits us to conceive of any important difference between them. "Logical activity" appears nowhere save as an acting of universals, and the very definition of "universal" requires the notion of activity.

Thus, epistemologically, the red sunset in my dream of a sunset I saw last summer in the mountains is a repetition of the same identical system of propositions that generated the sunset itself. It is not an "idea" of the sunset, nor an image, nor a representation, but the thing itself, more or less. In the world of the physicist the fall of a feather and the movement of the moon are reduplications of the identical generative formula that propelled the apple upon Newton's

cranium. Immanent in these diverse items are "eternally valid and simultaneously predetermined aspects" which "you must not confuse with the temporal succession of your verifications of the order." The foregoing quotation is from Royce, whose essay (the Supplementary, at the end of "The World and the Individual") Holt acknowledges as the correct basis for his definition of the "universal." The warning contained in the quotation he ignores, however, as he must, being a realist, and the result is the emergence of self-contradiction, of that B-not-B which "no one has ever experienced" and the possibility of which Holt denies.

For example: two particles, in motion, generated by the logical activity of an identical proposition of dynamics, and repeating this identical like two Dromios, encounter in space. At the point where both motions disappear, contradiction is. Holt speaks of it (pp. 272–279) as if it were mere contradiction or opposition, and not *self*-contradiction: "To be sure the unthinkable does not happen among objects, nor yet indeed does any one subjectively think it; no single particle moves in opposite directions at once, and this is also meaningless. The contradiction is, of course, between *propositions;* which are in the present case expressed as *equations of motion.*" Note the plurals. They indicate that Holt is thinking, not logically, but intelligently. For if his description of the universal and its relation to its instances is correct, then the contradictory equations and propositions are not two but one, not different but identical. In the collision, one and the same dynamic law, confronted with itself as its complete, self-representative double, negates itself. O shade of Hegel! this is what comes from declaring numerical diversity and other diversities irrelevant, and irrelevant they must be, since it is the identical proposition that *operates.* If now as we must further assume, this proposition, being eternal, goes on operating although it has contradicted itself, there is no logical reason why the particle on which it acts should not move in opposite directions at once. This may be meaningless, but it is logical. As Holt does in point of fact prefer meaning something to being logical, his actual treatment of the matter does implicitly assume that the differences—differences in locus, differences in function, differences in origin—are operative and important, because they actually *make* a difference. This being the case, what, once more, becomes of the identity of appearance and reality, of thought and thing?

3. The "thing" is, according to Holt, a more or less complicated aggregate of neutral entities which constitute an object in the physical world when defined by one generative proposition, and an object in the mental world or consciousness when responded to with a specific response by an aggregate defined by another generative propo-

sition so as to mate up a living body with a nervous system. The identical aggregate figures in the two systems at the same time without being in any way altered by either. Its differentia as consciousness is a nervous system's *specific response* to it.

In many ways, this notion of "specific response" is begged. It is the last of the necessary indefinables in the Holtian system. Complex as it is, it should have been "deduced," by way of "logical activity" and "universal," but it is arrived at empirically, on observational, not imaginative, grounds, and although it logically depends upon, it is treated as coordinate with, those notions, whose chief function in the "concept of consciousness" is to serve the demonstration of the immanence of past and future in present knowledge, and of the objectivity of error. "Specific response" involves difficulties peculiar to itself.

Holt finds its beginnings in the tropisms of plant-life and its culmination in the simple or complicated reflex movements of animal life. The reflex-arc, which is its "physiological or functional unit," is, in its anatomical essentials, the same in animals and plants. It is the basic mechanism of response, "further differentiated and wonderfully coordinated in a nervous system." Each reflex-arc corresponds strictly and specifically, both alone and in its integration with its fellow reflex-arcs in the nervous system, to definite and specific items of environment. The correspondence is a one-one correspondence, fixed and predeterminate for each and every arc and each and every integration of such arcs. This is why the response is *specific response.* The manner of it constitutes the knowing process.

"Specific response," it will be seen, is a concept which extends the field of consciousness to the vegetable world. Stopping with the vegetable world is, however, purely arbitrary. From the reflexes of protoplasm to the reflexes of preprotoplasmic matter, of colloids, of crystals, of what not, is an easy and inevitable step. In fact, the world is just chuck full of specific responses that inanimate entities exhibit toward each other—the specific affinities of chemicals, the specific reverberations of resonators, the specific reflections of mirrors, and so on. Can it then be said that the difference between the vital and the non-vital, the conscious and the unconscious, lies in the specificity of its response to its environment, or in the complexity of the specifications? And inasmuch as the complexity is purely structural, it can hardly be declared to introduce anything new or different. If consciousness is no more than the specific response of one neutral entity or a collection of such to another or to a collection of others, consciousness can not be denied any entity namable. The logical upshot is an inverted panpsychism.

Now an inverted panpsychism is no more than a restatement of

the problem. Consciousness being an entity of any kind specifically responded to by an entity of the same or another kind, the definition and identification of that familiar *quale* which science, dialectic, and the daily life know as consciousness, needs still to be made. Its nature and differentiae are not designated by, even though they may have been grounded in, the notion of specific response. Grant that "specific response" is the cause or basis of consciousness, it is as perverting to identify it with consciousness as such as it is to identify the specific response of hydrogen to oxygen with water as such, or ether vibrations with light. Water and light are just what hydrogen and oxygen and ether-vibrations are not; they possess qualitative characters quite different from, and in the very least additive to the latter: and their nature lies in those characters and in nothing else besides.

I can not help thinking, hence, that this bold and imaginative attempt to analyze away the genuine differentiae of consciousness is due not so much to observation as to reaction against the excesses of subjectivism and the clumsy difficulties of representativist theories of knowledge. Reaction against subjectivism has led to a pan-objectivism, in fact to a panic-objectivism, by way of an attenuation of all cases of consciousness to a purely external relation and of the formulation of self-contradictory conceptions of "activity" and "universal." Activity is conceived, as we have noted, as eternalist and static; the universal as self-repetitive, so that the sameness which two instances of a quality or proposition possess is a Platonic sameness. The difficulties of representationism are involved ultimately in psychophysical parallelism. Reaction against that leads to the identification of "thought" and "thing." But neither parallelism nor representationism is escaped in this way. They are merely restated and obscured in new terms. Analysis reveals, as Mr. Lowenthal has shown,[2] a parallelism closely resembling Spinoza's, and a *de facto* dualism in which identity is actually established by an *identification,* such that the content of consciousness is a process of meaning and its object a thing meant. Their eventual coalescence through verification is then defined retrospectively as identity. The slurring is made possible by notions of "universal" and "activity," which enable Holt to regard them as one and not two even when they *are* two, and so to discount their *becoming* one.

I respond, let us say, in memory, specifically, to a certain continental town. There exists then a one-one correspondence between the constituent reflex-arcs of my responsive mechanism and certain predetermined entities of the town's aggregate, which are thereby my consciousness. The relationship is static, coordinative, not causal. Neither I nor the town is altered in any way thereby. What-

[2] This JOURNAL, Vol. XII., pp. 703 *seq.*

ever changes the reflexes of my nervous system may undergo, are changes that belong in a series other than those neutral entities to which it responds, and conversely. Nervous system and field of response do not cause each other to change; they change *with* each other. This is nothing if not parallelism, and parallelism and representationism it must be. For consider: "The little group of neutral entities which is the intersection of the 'actual town' and of 'actual space' with the recalling consciousness, and which, while remaining identically itself, is a member of both systems, has two positions,—one in the spatial manifold, and one in the conscious or knowledge-manifold." Now by virtue of these *two* positions the *identical* group may undergo changes in either which will not affect it in the other. The little group of neutral entities may be destroyed in the spatial manifold, yet remain whole in the knowledge manifold, and *vice versa.* Thus they may both be and not be at the same time. Then either idea and object are empirically different from one another, but capable by a process of verification of merging into one another, or they are the same, but immobile and indestructible, and defined differently by different "generative propositions" as "things" and "thoughts." The consequences of the latter alternative are, however, a static universe, and a rigid panpsychistic parallelism.

I have said enough. That the "concept of consciousness" does not turn out complete fiction is only an indication that its author was after all too sensitive to the data of immediate experience to carry out his method implacably to the end. His book is far from the consistent deductive system he meant it to be. As it develops, its general outline gets filled with the living detail of acute observation and suggestive hypothesis; his terms regain their customary meanings, and his subject-matter its customary semblance. The passion for logic becomes checked and overlaid by an equally strong passion for fact; consistency gets swamped by correctness. The result is an imaginative distortion of reality of much beauty, some scientific worth, and great freshness and originality. To keep his system on the level of science Mr. Holt would need to acknowledge the human bias in its formulation, and to regard it simply as another instrument in the organization and control of the data of experience. He would, in a word, need to adopt the position of the pragmatists.

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REVIEWS AND ABSTRACTS OF LITERATURE

What is Living and What is Dead of the Philosophy of Hegel. BENEDETTO CROCE. Translated by DOUGLAS AINSLIE. London: Macmillan and Company, 1915. Pp. xviii + 217.

Of the faithfulness of the translation the present reviewer is not competent to speak; he will therefore endeavor only to estimate the value for metaphysics of Signor Croce's contribution. As the title indicates, the author's aim is more than historical; it is, in the broader sense of the term, critical. He believes—doubtless rightly—that certain errors and excesses have not prevented Hegel's system from affording fundamental truths. What then, in his view, are these truths? The first concerns method. "Hegel is one of those philosophers who have made not only immediate reality, but philosophy itself the object of their thought, thus contributing to elaborate a *logic of philosophy*. I believe, therefore, that the logic of philosophy (with the consequences ensuing from it for the solution of particular problems and for the conception of life) was the goal to which the main effort of his mind was directed" (p. 1). "In any case the hope of understanding and of judging the work of Hegel is vain, if we do not always keep clearly before the mind that this problem . . . was his main and principal problem, the central problem of the 'Phenomenology of Spirit,' and of the new forms assumed by this book in the 'Science of Logic' and in the 'Encyclopedia of Philosophical Science'" (p. 5). In these statements it is difficult, we must admit, to see more than a concession to the subjective bias of present-day philosophy. If the "logic of philosophy" is aught but an account of the ways in which we *do* think, it would seem that it can be only an account of the ways in which we *ought* to think; and what is that, in Hegel's view, but the description of the way reality is constituted? There is no apparent advantage in putting the matter in terms of methodology and the subjective, rather than in terms of the nature of ultimate reality. The distinction of Hegel from most of the philosophers of his own and succeeding periods lay in his objective-mindedness. And if he, too, being modern, sometimes failed to preserve the distinction, let us not forget that he made it. We can not but feel that in this point Signor Croce has a little obscured one of the vital things in Hegel.

But let us pass to the further fundamental truths. "Above all, what should be made clear is the triple character that philosophic thought [we should prefer to say, reality] assumes in Hegel. . . . Philosophical thought is for Hegel: firstly, concept; secondly, universal; thirdly, concrete" (p. 5). "And in order to elucidate this triple difference, . . . it would be necessary to include in a complete exposition the minor doctrines, which are attached to the first and fundamental doctrine, some of which are of great importance, such as the resumption of the ontological argument (the defence of Saint Anselm against Kant), which maintains that in the philosophic concept, as distinct and different from mere representations of particulars, essence implies existence. Another is . . ." etc., etc. (pp.

7–8). "But it is not my intention to offer in these pages a complete exposition of Hegel's system, nor even of his logical doctrine; but rather to concentrate all attention upon the most characteristic part of his thought, upon the new aspects of truth revealed by him, and upon the errors which he allowed to persist or in which he became entangled. For this reason, then, I set aside the various theses briefly mentioned above . . . and I come without further ado to the point around which all the disputes have been kindled and against which his opponents have aimed their direct denials—the treatment of the problem of *opposites*" (p. 9). This is the famous "dialectic"; and the author is occupied for the rest of the book with the endeavor to show that while the dialectic is true and lasting, yet as used by Hegel it contains a confusion which has rendered much of the system fantastic and sterile. The exposition, after preliminary and rather general statements of the confusion in the first three chapters, traces its consequences in the seven succeeding, with a concluding summary chapter entitled "The Criticism and Continuation of the Thought of Hegel."

On the whole, the exposition seems cast a little more in the poetic than in the logical mold; one might even complain of vagueness here and there. In consequence, the reviewer feels that he may not have caught the ideas of the author, and may hope in case of error to be corrected. The main point seems to be that while the dialectic is true of certain aspects of reality which are distinct but not opposed, it does not hold of certain others which are distinct and opposed. Thus, "fancy" and "intellect" (p. 9) are distinct from each other, yet each works with the other, helping to express the other, and both combine in a true Hegelian synthesis or organic unity. That is, "two distinct concepts unite with one another, although they are distinct; but two opposite concepts seem to exclude one another [the "one another" is perhaps the translator's fault] (p. 10). "But examples of opposite concepts are drawn from those numerous couples of words, of which our language is full and which certainly do not constitute peaceable and friendly couples. Such are the antitheses of *true* and *false,* of *good* and *evil,* . . . *positive* and *negative, life* and *death, being* and *not-being,* and so on" (pp. 10–11). Now the distinct things can unite as they are; the opposites can not unite except as there occurs process, change, becoming. For change is a combination of being and not-being, yet in a sense different from that in which mind is a combination of fancy and intellect. The two modes of combination are as divergent as dynamic and static. "The opposites are opposed to one another, but they are not opposed to unity. For true and concrete unity is nothing but the unity, or synthesis, of opposites. It is not immobility, it is movement. It is not fixity, but development" (pp. 19–20). And "the concrete universal, with its synthesis of opposites, expresses life and not the corpse of life; it gives the *physiology,* not the *anatomy,* of the real" (p. 21). The dialectic is dynamic as well as static, but it has a distinct meaning in each of these. The opposites are but abstractions, having no concrete existence; the distinct aspects or stages have concrete existence. Being and nonbeing are never themselves found in experience; becoming alone is the

reality, from which they are abstracted by the thinker. But fancy and intellect are concrete facts, and have their being apart from the thought of the psychologist who separates them out from mind. The consequence of overlooking this distinction was that for Hegel, mere abstractions "came to acquire the dignity of partial or particular concepts, that is of *distinct concepts;* and on the other, what are really *distinct concepts* were lowered to the level of simple attempts at truth, to incomplete and imperfect truths; that is to say, they assumed the aspect of *philosophical errors*" (p. 100). Thus, concrete matters such as art, history, science, were considered abstract and erroneous; Hegel failed to see their autonomy and their positive nature. The same is true of language. Hegel considers language as "attempting to express the individual, and, on the contrary, always expressing the universal" (p. 125). But "language is essentially poetry and art: by language, or by artistic expression, we grasp individual reality, that individual shading, which one spirit intuits and renders, not in terms of concepts, but in sounds, tones, colors, lines, and so on" (p. 125). In brief, Hegel interpreted various parts of reality too narrowly, and then condemned them for being too narrow. We believe there is justice in the criticism of Signor Croce. The familiar arguments (repeated in our day so often) against the truth of scientific laws, linguistic propositions, esthetic insight, generally rest upon too little investigation of what those laws, propositions, and insights really mean and express.

Such is the main criticism offered by the book. It is ramified in interesting ways; particularly in the field of history, where Hegel would deduce the various greater institutions. Of his excess in the discussions of geography and other empirical domains, sufficient notice is taken. "The ancient world exhibited the complete division into three parts; of which the first, Africa (the region of metal . . .), is mute spirit, which does not attain to knowledge; the second, Asia, is splendid bacchantic dissipation, the region of formless and indeterminate generation, which can not order itself; and the third, Europe, represents consciousness, and constitutes the rational part of the earth, with its equilibrium of rivers, valleys, and mountains; and the center of Europe is Germany" (pp. 184–185). Certainly Hegel is not idolized by our author. At the same time, the latter appears to accept the dialectic as a whole, giving it objective validity and application to the development in time.

In these days of careless diction it would be wrong to pass over certain expressions which are probably to be attributed to the translator. "Discussing recently . . . with a leading statesman, he [the statesman] remarked . . ." (p. xvii). On page 25 we find the illicit word "quatriad" instead of "tetrad." On page 93: "This is an essential point: if neglected we fall into the equivocation. . . . On page 112: "we can proceed . . . by *dis*composition." And on page 176: "The second abuse is the most commonly known." It must be admitted also that the general impression of the English is one of vagueness, even at times of incoherence; but this may not be the translator's fault. If Hegel, as Croce is said (p. xii) to urge (I can not find where he does so), is to be "read like a poet" he

certainly should not be expounded or criticized in that manner. We can not but think that the Italian author, gifted as he undoubtedly is in sympathetic insight, would have contributed more to progress in metaphysics, if he had connected his account of the dialectic with some of the more recent logical discussions of relation contributed by France, England, and America.

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A Theory of Time and Space. A. A. ROBB. Cambridge, England: University Press. 1914. Pp. vi + 373.

This book represents an attempt to discuss the theory of relativity from a mathematical standpoint by deriving the formal properties which space and time possess, according to this theory, from a set of postulates concerning the relation of temporal succession. It has been recognized for some years that there is no method by which we can discriminate between the electromagnetic or optical properties of a system at absolute rest and those of a system moving at a constant velocity. The famous experiment of Michelson and Morley destroyed almost the last hope of discovering, by electromagnetic or optical means, the direction and magnitude of the absolute velocity of a point on the surface of the earth, and suggested very strongly that *no difference whatever* could be found between the electromagnetic formulæ of a fixed system and those of one moving without acceleration. This gave Einstein the idea that there might, after all, be no difference between absolute rest and unaccelerated motion, and that what is now regarded as a system of fixed axes of coordinates with reference to which we determine the direction and magnitude of a motion may, from another equally valid standpoint, be regarded as moving with a constant velocity with reference to another set of axes of coordinates which, from this standpoint, are regarded as fixed. These interrelations of the velocity of a system and the position of what we take as our standard axes of coordinates turn out, according to the laws of optics, to be such as can not be expressed except by supposing that space and time are not independent, and that we can not say that two events are simultaneous without involving some reference to the positions of these two events in space, or to some physical magnitude, such as a velocity, which can only be defined in terms both of spatial and of temporal entities. Certain analytical formulæ have been found, which express those essential connections which must subsist between the spatial relations of an event and its temporal relations, unless there is some reason for regarding rest as intrinsically different from unaccelerated motion—and no experiment has been found which enables us to distinguish between these two states. Now, this interdependence of time and space can not be expressed in terms of these two principles, as we ordinarily conceive them, in such a manner that time constitutes a dimension of Being independent of the three dimensions of ordinary space. It is consequently necessary to give a new formal analysis of the four-dimensional manifold constituted by time and space together. Two methods of carrying out this analysis have been

suggested: one is that of Einstein, while the other is that developed by Robb in this book.

Einstein "made the suggestion that events might be simultaneous to one observer, but not to another,"[1] and developed a theory of the relation between space and time on this basis. Robb rejects this view, since, he claims, it conflicts with the logical fact that "a thing can not both be and not be at the same time." His rejection rests on a misinterpretation of what is meant by this statement. "At the same time" is simply a metaphor for "taken in the same sense and under the same conditions," and has nothing in particular to do with time. If to say that the event X occurs at the moment indicated by the event Y in the system of time measured with respect to the set of coordinate axes S expresses a different condition concerning X than to say that X is simultaneous with Y with reference to a set of axes T, there is no reason why the maxim cited by Robb should demand that the truth of one of these statements should imply that of the other. If, on the other hand, we accept the truth of the statement that "a thing can not both be and not be at the same time," we must accept this as a physical hypothesis, and not as a logical fact, and it is just as capable of correction and rejection in the course of our further study of physics as any of the other apparent truisms that have been discarded by the upholders of the theory of relativity.

Instead of attempting, like Einstein, to approach the problem of the relation between time and space by allowing the simultaneity of two events to depend upon the set of coordinates chosen as fixed, Robb bases his theory of space and time upon the relation of temporal succession. This, unlike Einstein, he regards as absolute: that is, he holds that if an event in time follows another, it does so without any reference to a set of fixed coordinates. He consequently escapes from the difficulty which he finds in the work of Einstein. To this relation of temporal succession he gives a physical interpretation essentially optical in nature: one instant follows another if a flash of light starting at the second can reach the first either directly or after reflection. An instant in this sense corresponds not to what we should ordinarily regard as an instant, but to an instant *at a particular point in space*. Robb phrases his definition of an instant in a manner somewhat more general than that in which I have just stated it: he says, "If an instant B be distinct from an instant A, then B will be said to be *after* A, if, and only if, it be abstractly possible for a person, at the instant A, to produce an effect at the instant B" (p. 7). This is rather awkwardly put. Entirely apart from the utterly needless introduction of the notion of a "person," it presupposes that we have a fixed and definite notion of what is meant by "causation," not to speak of "the abstract possibility of causation." It is fairly obvious that the notion of causation is at least as obscure as that of time, and that a theory which so radically upsets our established notions of time as the theory of relativity does can not but cause an equally great modification in our views on causality. However, while these alterations in our theory of time have been

[1] Robb, p. 2.

systematized and organized by the very people who have brought them about, the corresponding work has not been done with the theory of causality. It is indeed much more natural to define causality in terms of time than it is to define time in terms of causality.

What an "abstract possibility of causation" is, I do not know, and I doubt if the phrase has any clear and definite meaning whatever. In any case, Robb defines *ignotum per ignotius*.

While the philosophical basis of Robb's work is rather unsatisfactory, his book has an unquestionably great philosophical significance. That space and time form a system such that neither can be studied without reference to the other, while it is already brought out in the work of Einstein, receives much greater prominence in that of Robb, owing to the fact that he develops a theory of pure mathematics on the basis of a set of postulates which is at once spatial and temporal, which embraces both pure geometry and what may be called rational chronology; in which, however, these two elements can not be separated. Robb has at once made the consideration of space necessary in the discussion of the relation of time to experience, and forged an instrument which enables us to carry out this joint consideration of space and of time. To an even greater extent than Einstein, he has made it obvious that the two problems of Kant's "Transcendental Esthetic" are really but two aspects of a single problem. Furthermore, as a by-product of this philosophical task, he has created a new branch of mathematics of a very considerable intrinsic interest.

Of the technical development of the book one can only speak with the greatest admiration. As has been said, the relation of temporal succession is taken as the primitive idea. This is regarded as asymmetrical and transitive, but not as connected: that is, of two distinct instants, one need not follow the other. However, of a set of instants that represent the successive positions of a particle, one must precede or follow any other, so that the time-path of a particle is serial in character and, in general, has all those formal properties that we normally predicate of time. The relation of temporal succession is closely analogous to that of a cone A, with a vertical axis and a certain given vertical angle, to another such cone B, when the vertex of A lies on or within the upper nappe of B. Most of the postulates in the book apply to this relation among cones as well as to the relation of succession among instants. These postulates are well chosen, and for the most part satisfy the condition of independence. The various forms of the notions which he calls by the names of line, plane, and threefold are developed in terms of the relation of succession among instants, and finally a theory of measurement entirely dependent on the relation of temporal succession, and on that alone, is given, which is such that the fundamental formulæ of the theory of relativity, as developed by Einstein and Minkowski, result solely from Robb's postulates.

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The Investigation of Mind in Animals. E. M. SMITH. Cambridge: University Press, 1915. Pp. ix + 194.

Anything approaching a complete system of animal psychology is well-night impossible at present in face of the conflicting interpretations of even the simplest reactions and the lack of evidence upon the mechanism of more complex behavior. At best one can but adopt a point of view borrowed either from physiology or from human subjective psychology, and this necessarily determines the direction of interest and colors the interpretation of experimental data. In his discussion of animal behavior Smith distinctly takes the subjective viewpoint; his problems have to do less with the causal analysis of the animal's reaction than with the value of behavior as evidence for the presence of consciousness in its various disguises as images, ideas, intelligence. In a book purporting to present in brief the "aims, trend, and the general nature of the results" of animal psychology this seems a rather restricted outlook. Certainly many investigators will not agree that the subjective interpretation of behavior data is the chief business of the science; indeed, not a few are inclined to deny that this problem is a legitimate one. In the hands of Watson, Pawlow, and others the study of animals has been of prime importance in encouraging the demand for a strictly physiological analysis of the activities even of man and in discrediting the utility of "psychic causality" as a scientific instrument. Problems such as the reflex nature of instinct, the mechanism of learning, and the physiology of reinforcement and inhibition in conditioned reflexes are among the most important contributions of the study of animals and should scarcely be omitted even from a popular exposition of the aims of animal psychology, yet one finds no mention of them in this volume.

I do not wish to leave the impression that the book is wholly given up to a discussion of consciousness in animals. On the contrary, very little actual space is given to the question, and interesting and critical reviews of recent experimental work make up the greater part of the text. The presentation of the methods most generally employed in behavior studies is excellent, particularly in the chapters devoted to learning. Here good criticisms of the technique of maze, problem-box, and discrimination methods are given with a review of the difficulties met in the study of sensory physiology by the discrimination and conditioned reflex methods. The first chapter considers the questions of plasticity of reaction and habit formation in protozoa. Here the author seemingly overlooks the work of Metalnikow, which is the best positive evidence that we have. The treatment of instincts is especially interesting, including an account of the relations between stimulus and instinctive reaction which give the latter plasticity, and correlating Cunningham's theory of hormones with periodic instincts. A special chapter is devoted to homing, which gives a good account of the more important studies and theories dealing with this instinct. Many experiments on imitation are reviewed and the final chapter is devoted to the methods which have been used to judge the degree of complexity of habits which the animal can form.

The book is designed primarily for the non-technical reader, is simply and clearly written, and reflects the careful, critical attitude of the best experimental studies. But here again the limitations of the subjective viewpoint are evident in that no answer is given to the first question of every lay reader: "What is the use of all this?" The practical contributions of animal psychology considered as the study of "mind" in animals are difficult to find. The book is too brief to serve as a text, but should prove useful as supplementary reading in introductory courses where little time can be given to animal behavior.

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JOURNALS AND NEW BOOKS

REVUE DE MÉTAPHYSIQUE ET DE MORALE. March, 1916. *Quatre nouveaux manuscrits inédits publiés par P. Tisserand* (pp. 295–330). MAIN DE BIRAN.–These manuscripts are (1) Reflections on the General Forces which Animate Nature, (2) Psychological Notes, (3) Magnetism and Somnambulism, (4) On the Analytic Method. *L'Arithmétique et la théorie de la connaissance* (pp. 331–342). L. BRUNSCHVIEG.–"Arithmetic, although wholly rational, or more exactly because it is wholly rational, is an instrument which is forged through contact with experience and which does not cease to sharpen itself by this contact." *La Sophistique. Étude de philosophie comparée* (pp. 343–362). MASSON-OURSEL.–Sophistic thought is a characteristic of certain periods in every civilization. Its appearances in Greece, India, and China are compared. *Études critiques. Un essai de Psychologie historique: William Godwin:* DOLLÉANS. *Questions practiques. Guerre et Morale:* D. PARODI.

Heathcote, Charles William. The Essentials of Religious Education. Boston: Sherman, French, and Company. 1916. Pp. 290. $1.50.

Philosophie Religieuse et Pratique: Ses Bases, Règles et Conséquences. 2 Vols. Paris: Girard et Brière. 1915. Pp. 638 and 563.

Rousseau, Jean Jacques. Political Writings. Edited from the Original Manuscripts and Authentic Editions with Introductions and Notes by C. E. Vaughan. 2 Vols. Cambridge: University Press; New York: G. P. Putnam's Sons. 1915. Pp. xix + 516 and 577. $18.50.

Seashore, Carl E. Vocational Guidance in Music. University of Iowa Monographs, First Series, No. 2. Iowa City. 1916. Pp. 11.

NOTES AND NEWS

To the Editors of the Journal of Philosophy, Psychology, and Scientific Methods:

In an article in this Journal[1] Professor Warren, replying to Professor Moore and defending his own anti-teleological beliefs, points out an ambiguity in the term chance. Popularly it is often used to denote "an uncaused result"; and Professor Warren, like every other observant man, dismisses such a fancy. But there is also "a legitimate scientific use of the term chance." "When one meets a friend 'by chance,' we suppose two separate series of events each of which by itself is causally determined; but the conjunction of the two series at this particular point is not the result of either set of causes."

Of what, then, is it the result? Has Professor Warren considered how wide a door he opens here for escape from a mechanic universe? This doctrine does not easily harmonize with his previous profoundly interesting papers, but on the contrary provides all the room for "purpose" which any wise teleologist could desire. Wherever chance may be, without disturbing "regulated causation," these foreseen adjustments might equally well be. To adopt such a notion of chance is to confine the work of "science" to tracing lines of causal sequence, while at the same time acknowledging that these by no means fully explain our hourly happenings. I have no desire to argue the point, having already devoted a chapter to it in my "Problem of Freedom," published five years ago. I would merely call attention to Professor Warren's admirable definition of chance and note how well it provides independent spheres of influence for teleology and mechanism. In entire agreement with it, I formerly wrote, "The world is full of accidents. Its faults struggle and conflict and ignore one another and demonstrate how far it is from being a complete organic whole. It is an error to speak of the world as ruled by law; it is ruled by laws, each pretty regardless of its neighbor. Everywhere it is the business of mind to bring these laws into cooperation. The world's melodies, its ties of succession, are due to its own mechanism; its harmonies are either ethical or accidental."[2]

Very truly yours,
G. H. Palmer.

Harvard University,
September 5, 1916.

The Section of Anthropology and Psychology of the New York Academy of Sciences met on October 23 in conjunction with the American Ethnological Society at the American Museum of Natural History. The following papers were read: "Social Organization of the Arizona Apache," Dr. Pliny Goddard; "The Hopi Clan," Dr. Robert H. Lowie.

[1] Vol. XIII., p. 441.
[2] "The Problem of Freedom," p. 139.